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The Correlation of Self-Regulation Theory Constructs and the Incidence of Intradialytic Complications during Hemodialysis



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Abstract

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Hemodialysis is currently applied as a routine treatment that is widely used by patients with chronic kidney failure, though complications still occur during dialysis. Self-regulation is a kind of theoretical model that represents the effect of perceived disease on behavior and health-related consequences. There is a process of problem representation, coping and appraisal or assessment of coping success involved in self-regulation. This study aimed to determine the correlation between self-regulation theory constructs and the incidence of intradialytic complications during hemodialysis. This was a descriptive analytic study with cross-sectional design. Consecutive sampling resulted in 42 respondents. Logistic regression results obtained disease representation variable with timeline ($p=0.122$; $OR=0.412$) and control ($p=0.068$; $OR=0.582$) sub-variables; as well as coping variable with Problem-focused ($p=0.219$; $OR=0.912$) and emotion-focused ($p=0.036$; $OR=0.3$) sub-variables. Intradialytic complications are complex conditions that involve many factors, but the patient's psychological adaptation process also deserves to be considered in developing self-regulation among hemodialysis patients. It is necessary to consider the provision of health education based on the constructs of this self-regulation theory, especially on variables/factors that have a correlation with the incidence of intradialytic complications in order to improve self-management among hemodialysis patients to get a better life.

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INTRODUCTION

Hemodialysis is currently applied as a routine treatment that is widely used by patients with chronic kidney failure. However, side effects are frequently encountered during dialysis, which may be due to technical problems, and patient comorbidities. Intradialysis complications can be experienced by patients during hemodialysis in the forms of hypotension, muscle cramps, nausea, vomiting, headache, chest pain, fever and chills, hypertension, disequilibrium syndrome, arrhythmia, hemolysis, air embolism and shortness of breath during hemodialysis. Heart disease is the most common cause of death for people with dialysis (American Kidney Fund, 2019).

Intradialytic complications are often associated with high IDWG (Interdialytic weight gain) and poor prognosis (Gul et al., 2016). The results of therapy will not be optimal without the awareness of the patient to maintain his life, and this can also lead to therapy failure or complications that are detrimental and fatal (Endah & Supadmi, 2016). Based on the results of observations in September 2020 in the Hemodialysis Unit of Mardi Maluyo Regional General Hospital, Blitar, it was found that about 60% patients did not comply with the advice given regarding fluid restriction, so that in the further hemodialysis therapy, patients still often came with certain complaints such as shortness of breath, weight gain exceeding 5% of the patient's dry weight and uremic symptoms (nausea, vomiting, anorexia), which resulted in commonly experienced complications, namely hypotension and hypertension. The main principles in managing chronic diseases such as CKD are patient involvement and acceptance of responsibility for controlling complications with self-care behaviors.

Self regulation stems from the individual's efforts to maintain the status quo and return to a 'normal' state of health. Emotional reactions can appear at any stage. Cultural or social differences, for example regarding perception of symptoms or expectations of disease, can lead to different representations and different coping structures. Self-regulation actively emphasizes the individual ability and how the individual can operate and reflect on his actions.

The concept of self regulation theory can identify the patient's ability to self-regulate through his ability to recognize the disease (illness cognition) wherein the patient is able to develop constructive

coping. This constructive coping will maximize the patient's potential for self-regulation. A study conducted by Chirona et al., (2019) identified information about models and theories of care for the management of patients with CKD (Chronic Kidney Disease) which could improve patient compliance. The advantage of the Common Sense Model (Self Regulation) theory is sourced from the theory of individuals who act to prevent, treat, cure or adapt to acute or chronic diseases experienced and a good self-regulation process will help individuals to manage the disease and this further improve compliance.

Self-regulation strategies among hemodialysis patients need to be observed so that appropriate interventions can be planned and eventually, interdialysis complications do not occur since increasing self-control was revealed to decrease morbidity and mortality rates among this vulnerable population (Kauric-Klein et al., 2017). Problem solving process is referred to analysis on the constructs of self-regulation theory. Solving health problems is basically no different from solving other problems. There is a process of problem representation, coping and appraisal or assessment of coping success in self-regulation (Ogden, 2007). Based on the description above, the researchers intended to observe the correlation between self-regulation theory constructs and the incidence of intradialytic complications during hemodialysis.

METHODS

This was a descriptive analytic study with a cross-sectional design. The samples were collected using consecutive sampling technique which resulted in 42 respondents. The independent variable in this study was the constructs of self-regulation theory with the instrument of disease representation factor variable developed by the researchers by adapting the illness perception questionnaire (Weinman, 2000). Furthermore, coping variable was measured using a questionnaire developed by researchers by adapting the Ways of Coping developed by Lazarus and Folkman (Vitaliano et al., 2016). The Appraisal variable was measured using a questionnaire developed by the researcher by adapting the Primary Appraisal Secondary Appraisal Questionnaire (PASA) (Gaab, 2009) which was then modified according to the study objective. The dependent variable was intradialytic complications measured using an observation sheet for complica-

tions during the hemodialysis process. Bivariate analysis used chi-square statistical test which aims to test the difference in proportions. If the bivariate test obtained a p value of < 0.25, then the variable could be included in the multivariate model. Multivariate analysis used logistic regression analysis since there was a categorical dependent variable. Important variables included in the multivariate model were those with a p value of < 0.05. Variables that had an effect on the dependent variable were defined based on each p-value.

RESULTS

Table 1. Demographic Data of Respondents

No	Variable	N	%
1	Age		
	17-25	1	2.38
	26-35	3	7.14
	36-45	9	21.43
	46-55	18	42.86
	56-65	9	21.43
	> 66	2	4.76
2	Gender		
	Male	17	40.48
	Female	25	59.52
3	BP Pre HD		
	Hypotension	2	4.76
	Normal	22	52.38
	Hypertension	18	42.86
4	BP Post HD		
	Hypotension	3	7.14
	Normal	21	50.00
	Hypertension	18	42.86
5	Education on HD		
	never	8	19.05
	1 time	10	23.81
	3 times	9	21.43
	>3 times	15	35.71

Table 1 presents the number of respondents who underwent hemodialysis at the Hemodialysis Unit of Mardi Waluyo Regional General Hospital, Blitar City. The majority of them were aged between 46-55 years or as many as 18 respondents (42.86%). The majority were female or as many as 25 respondents (59.52%). Furthermore, 15 respondents (35.71%) ever received information on hemodialysis more than 3 times. Before hemodi-

Table 2. Intradialytic complications

Complication	N	%
Hypertension	15	35.71
Muscle cramp	39	92.86
Nausea	31	73.81
Headache	39	92.86
Chest pain	3	7.14
Itchy	30	71.43
Hypotension	23	54.76

alysis, the majority of respondents had normal blood pressure or as many as 22 respondents (52.38%) and after hemodialysis as many as 21 respondents (50%) had normal blood pressure.

Table 2 presents the intradialytic complications experienced by the respondents. The most common complications experienced by patients were muscle cramps and headaches, as many a 39 respondents (92.86%) respectively.

Table 3 presents the results of bivariate selection. Not all variables showed a p value of <0.25 as a requirement to be included in the multivariate test. The variables that were included in the logistic regression analysis were those which had a p value of <0.25 in the bivariate analysis. Logistic regression results obtained disease representation variable with timeline (p=0.122) and control (p=0.068) sub-variables; as well as coping variable with Problem-focused (p=0.219) and emotion-focused (p=0.036) sub-variables.

Table 4 presents the test results of several variables, namely Timeline (p=0.211), Control (p=0.472), problem-focused coping (p=0.908), emotion-focused coping (0.143), which indicated that individually, the four variables had no significant effect on intradialytic complications, however simultaneously, these four variables had an effect on intradialytic complications with a p value = 0.044. Thus, it can be concluded that the equation obtained was $g(x) = (\text{constant}(1.375)) + (\text{timeline}(-0.887)) + (\text{control}(-0.0541)) + (\text{problem-focused} (-0.092)) + (\text{emotion-focused} (-1.203))$

Value of Independent Variable was 1 for severe intradialytic complications and 0 for mild dialytic complications.

The Table above shows a Nagelkerke R square value of 0.222 which meant that the contribution of the four variables, namely timeline, control, problem-focused coping, and emotion-focused coping

Table 3. Bivariate selection of variables in self-regulation theory with the level of complications experienced by patients during hemodialysis at Mardi Waluyo general hospital, Blitar (n=42).

No	Variable	Sub-Variable	Category	Mild		Severe		p value
				N	%	n	%	
1	Disease Representation	Identity	Mild	21	53.8	18	46.2	0.503
			Severe	1	33.3	2	66.7	
		Cause	Couldn't recognize	19	54.3	16	45.7	0.582
			Could recognize	3	42.9	4	57.1	
		Timeline	Negative	13	65	7	35	0.122 ^{*)}
			Positive	9	40.9	13	59.1	
		Consekuensi	Negative	13	50	13	50	0.694
			Positive	9	56.3	7	43.8	
Control	Negative	14	66.7	7	33.3	0.068 ^{*)}		
	Positive	8	38.1	13	61.9			
2	Appraisal	First Appraisal	Negative	22	53.7	19	46.3	1
			Positive	0	0	1	100	
		Second Appraisal	Negative	11	61.1	7	38.9	0.329
			Positive	11	45.8	13	54.2	
3	Coping	Problem-focused	Negative	14	61.9	8	38.1	0.219 ^{*)}
			Positive	9	42.9	12	57.1	
		Emotion-focused	Negative	17	65.4	9	34.6	0.036 ^{*)}
			Positive	5	31.3	11	68.8	

*) p value of < 0.25

Table 4. Variables correlated with intradialytic complications at Mardi Waluyo general hospital, Blitar (n=42)

		Coeff	S.E.	Wald	df	Value p	OR	CI 95%	
								Min	Max
Disease Representation	Timeline	-0.887	0.709	1.562	1	0.211	0.412	0.103	1.655
	Control	-0.541	0.753	0.517	1	0.472	0.582	0.133	2.545
Coping	Problem-focused	-0.092	0.795	0.013	1	0.908	0.912	0.192	4.338
	Emotion-focused	-1.203	0.822	2.144	1	0.143	0.300	0.060	1.503
	Constant	1.375	0.682	4.058	1	0.044	3.954		

Table 5. Nagelkerke R square value

Cox & Snell R Square	Nagelkerke R Square
0.116	0.222

Table 6. The Result of the Hosmer and Lemeshow Chi-square test

Chi-square	Df	Sig.
5.791	7	0.564

was able to explain the accuracy of 22% and the other 11% was explained by other factors.

The Table above presents the result of the Hosmer and Lemeshow Chi-square test with a p value of significance of 0.564 (>0.05), then H0 was accepted and the model had sufficiently explained the data (goodness of fit).

The Table above shows that the prediction accuracy in this study was 69%.

Table 7. Accuracy Prediction of the Study

Observed		Predicted		Percentage Correct
		Intradialytic Complication		
		Mild	Severe	
Intradialytic Complication	Mild	15	7	68.2
	Severe	6	14	70
Overall Percentage			69	

DISCUSSION

This study showed that 45% of patients aged 46-55 years experienced severe complications during the hemodialysis process. The perceived intradialytic complications were muscle cramps (92.86%), headache (92.86%), nausea (73.81%), itching (71.43%), and hypotension (54.76%). 57% of all patients had undergone hemodialysis for more than 3 years. Hypotension was found as the most common acute complication (20-50%) of HD followed by muscle cramps (20%), nausea and vomiting (5-15%), dialysis imbalance (10-20%), headache (5%), chest pain (2-5%), itching (5%), fever and chills (<1%), arrhythmias, hypoglycemia, bleeding, blood membrane interactions such as first use syndrome and acute hemolysis (Singh et al., 2015). The findings indicate that intradialytic complications may occur among new patients or old patients.

In this study, the constructs of self-regulation theory found that 4 subvariables from 2 variables had a relationship with the level of intradialytic complications, namely the timeline and control in the disease representation variable, and problem-focused coping and emotion-focused coping in the coping variable. Self regulation stems from the individual's efforts to maintain the status quo and return to a 'normal' state of health. Emotional reactions can appear at any stage. Cultural or social differences, for example regarding perception of symptoms or expectations of disease, can lead to different representations and different coping structures. Self-regulation actively emphasizes the individual ability and how the individual can operate and reflect on his actions (Cameron, 2012). This shows that self-regulation theory provides a framework for understanding the factors that can influence how a person perceives the threat of disease and how client beliefs influence client decisions in self-regulating health outcomes. However, not all frameworks/constructs in the theory are related to

this study which is only specialized in intradialytic complications. It has been described in table 5 that the contribution of the four variables, namely timeline, control, problem-focused coping, and emotion-focused coping was able to explain the accuracy of 22% and the other 11% was explained by other factors. Furthermore, it has been also revealed that the prediction accuracy in this study was 69%. The order of the sub-variables from strongest to weakest correlation was problem-focused coping (OR=0.912), Control (OR=0.582), Timeline (OR=0.412), and Emotion-focused coping (OR=0.300). The variables that were found to have a correlation with intradialytic complications are described below.

The Correlation of disease representation (timeline and control) and intradialytic complications

Disease representation in this study is defined as the perception of a health threatening disease based on sensations and symptoms. Perception is built on information received from three sources. The first source of information is generally obtained from previous social conversations or cultural knowledge and the effects of the disease. The second source of information is generated from significant people or authority figures such as nurses and doctors. The third sources of information are obtained from the individual's previous experience with the disease as well as their current experience with the disease (Parfeni et al., 2013). Timeline was one of the subvariables in the constructs of self-regulation theory that was proven to have a relationship with the level of intradialytic complications. It has been described in general self-regulation theory that health threats perceived due to chronic condition is associated with poorer psychological well-being, poorer social and role functioning and vitality, and greater psychological distress. Although

chronic condition timeline beliefs are usually associated with poorer outcomes, sometimes the opposite is true. This paradox highlights the complexities of self-management and the importance of determining the phenomenological representation of disease in the individual. For example, viewing a long-term condition as acute might lead to delays in treatment (McAndrew et al., 2018). Beliefs about the time to development and duration of a disease, the point in time for using a treatment regimen, the time required for cure or control, and the time from disease onset to death when no treatment is initiated are significant factors. So, it cannot be denied that delays or denial of people with a chronic disease such as hemodialysis patients can cause a worse condition, which is reflected in the level of intradialytic complications in the current study. Although intradialytic complications are clinical conditions related to the patient's physical condition, in this study it was shown that the patient's psychological condition could be a factor in the incidence of intradialytic complications.

In this study, control is defined as the client's perception of the ability to control the condition as part of the hemodialysis problem, indicating a relationship with the level of intradialytic complications. Feeling greater control over health threats usually leads to more active self-management, resulting in better outcomes. Likewise, feeling greater control over one's mental health leads to seeking psychotherapy attitude and/or engagement in preventive care to stop mental health problems before they get worse. Control belief also has an effect on the type of self-management approach chosen. This is especially important when cultural beliefs about how to control health threats do not match those of mental health providers (McAndrew et al., 2018). Based on general data, 35.71% of patients had received education on disease and hemodialysis, this is one thing that can develop the patient's ability to control the conditions experienced during routine hemodialysis therapy. This is in line with the opinion that action plans are effective in providing action strategies, but are not the same as helping them acquire the skills to plan themselves, or to build management routines automatically (Leventhal et al., 2016). The control mechanism in the self regulation theory is related to anticipation and perception of responsiveness to self-medication and expert intervention (nurses and doctors), which further creates a form of control that is appropriate for the conditions experienced. Intradialytic complications such as nau-

sea, vomiting, cramps, hypotension, headaches are less likely to occur if the control mechanism in self-regulation is running well, although many other factors outside of these factors can also influence the occurrence of intradialytic complications.

The Correlation of coping (emotion-focused and problem-focused) and intradialytic complications

In this study, sub-variables of emotion-focused and problem-focused involved in the coping variable had a relationship with intradialytic complications. These complications stressed patients out, requiring them to cope. Coping mechanisms are broadly categorized into problem-focused and emotion-focused. Most HD patients tend to use emotion-oriented coping strategy to deal with stress. Emotion-focused strategies have been associated with poor therapeutic outcomes and poor health-related quality of life). (Ndanu, 2020). Coping procedures are cognitive and behavioral actions that are taken (or not taken) to improve health and to prevent, treat (cure or control), and rehabilitate from disease which then forms self-regulation in which the system or mental set of mechanisms describe the self to solve health-medical problems, seek to improve self-health, and overcome the threat of disease, and redefine the problems being faced. Muscle cramps, headache were some of the most common intradialytic complications experienced by patients involved in this study. Intradialytic events have been reported to have physiological and psychological effects on patients. The majority of HD sessions were discontinued due to complications since certain intra-dialytic complications stressed the patients (Ndanu, 2020). The finding in Johnson's study (2017) regarding emotional-focused coping strategy used by the majority of hemodialysis patients revealed that stress during hemodialysis was significantly affected by coping strategies.

Although individuals undergoing outpatient hemodialysis are susceptible to many psychosocial stressors, many of which are potentially manageable and individuals should be encouraged to cope with manageable stressors. Efforts by the health care team to understand the coping strategies applied by patients undergoing hemodialysis are needed. Coping strategies are dynamic and change as people/environments change. Patients develop dynamic and interactive cognitive and emotional representations of their experiences to understand

their illness. They also develop specific representations of each coping procedure or treatment option. Guided by their representations, patients develop short- and long-term action plans and use specific coping procedures to manage symptoms and regulate negative emotions (Karekla et al., 2019).

CONCLUSION

The self-regulation model is the most widely used theory to explain and predict adaptation to disease as well as patient behavior and self-management choices. In this study, only 2 variable constructs of self-regulation had a correlation with intradialytic complications. Although intradialytic complications are complex conditions that involve many factors, the patient's psychological adaptation process also deserves to be considered to establish self-regulation among hemodialysis patients.

SUGGESTION

It is necessary to consider the provision of health education based on the constructs of this self-regulation theory, especially on variables/factors that have a correlation with the incidence of intradialytic complications in order to improve self-management among hemodialysis patients to get a better life.

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